

Exercise 1.58

Carry out the following conversions: (a) 0.105 in. to mm, (b) 0.650 qt to mL, (c) 8.75 $\mu\text{m/s}$ to km/hr, (d) 1.955 m^3 to yd^3 , (e) \$3.99/lb to dollars per kg, (f) 8.75 lb/ft^3 to g/mL .

Solution**Part (a)**

Convert from inches to millimeters using dimensional analysis.

$$0.105 \cancel{\text{in}} \times \frac{2.54 \cancel{\text{cm}}}{1 \cancel{\text{in}}} \times \frac{1 \cancel{\text{in}}}{100 \cancel{\text{cm}}} \times \frac{1000 \text{ mm}}{1 \cancel{\text{in}}} \approx 2.67 \text{ mm}$$

Part (b)

Convert from quarts to milliliters using dimensional analysis.

$$0.650 \cancel{\text{qt}} \times \frac{1 \cancel{\text{L}}}{1.0567 \cancel{\text{qt}}} \times \frac{1000 \text{ mL}}{1 \cancel{\text{L}}} \approx 615 \text{ mL}$$

Part (c)

Convert from micrometers per second to kilometers per hour using dimensional analysis.

$$8.75 \frac{\cancel{\mu\text{m}}}{\cancel{\text{s}}} \times \frac{1 \cancel{\text{m}}}{10^6 \cancel{\mu\text{m}}} \times \frac{1 \text{ km}}{1000 \cancel{\text{m}}} \times \frac{60 \cancel{\text{s}}}{1 \cancel{\text{min}}} \times \frac{60 \cancel{\text{min}}}{1 \text{ hr}} = 3.15 \times 10^{-5} \frac{\text{km}}{\text{hr}}$$

Part (d)

Convert from cubic meters to cubic yards using dimensional analysis.

$$1.955 \cancel{\text{m}^3} \times \left(\frac{100 \cancel{\text{cm}}}{1 \cancel{\text{m}}} \right)^3 \times \left(\frac{1 \cancel{\text{m}}}{2.54 \cancel{\text{cm}}} \right)^3 \times \left(\frac{1 \cancel{\text{ft}}}{12 \cancel{\text{in}}} \right)^3 \times \left(\frac{1 \text{ yd}}{3 \cancel{\text{ft}}} \right)^3 \approx 2.557 \text{ yd}^3$$

Part (e)

Convert from dollars per pound to dollars per kilogram using dimensional analysis.

$$3.99 \frac{\$}{\cancel{\text{lb}}} \times \frac{1 \cancel{\text{kg}}}{453.59 \cancel{\text{g}}} \times \frac{1000 \text{ g}}{1 \text{ kg}} \approx 8.80 \frac{\$}{\text{kg}}$$

Part (f)

Convert from pounds per cubic feet to grams per milliliter using dimensional analysis.

$$8.75 \frac{\cancel{\text{lb}}}{\cancel{\text{ft}^3}} \times \frac{453.59 \text{ g}}{1 \cancel{\text{lb}}} \times \left(\frac{1 \cancel{\text{ft}}}{12 \cancel{\text{in}}} \right)^3 \times \left(\frac{1 \cancel{\text{in}}}{2.54 \cancel{\text{cm}}} \right)^3 \times \frac{1 \cancel{\text{cm}^3}}{1 \text{ mL}} \approx 0.140 \frac{\text{g}}{\text{mL}}$$